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MTE Sup. XXXXX	[signature]	2-24-59		Project: XN XXXXX
Eng.	[signature]		Spec: ATS 1902142, 1700499, 1700500	Part #: 1041526 thru 536 1041500 thru 510
	[signature]	3-6-59		

Dept.	Model	Serial No.
54-22	6-204	-9 and above

SPEC REVISION				MTP REVISION	
Rev. Orig.	Dept. D754-22	Model 6-204	Serial No. -9 & above	Re-write	12-31-8
"	"	"	"	"	1-27-9
B	57-22	"	AX10 Link 3, + AX11 & up	4:4.12 10: all 11: top	3-6-9

Reference: LMSD 1041565 Schematic DLO -1
LMSD 1041566 Schematic DLO -2

NOTE: Sections 1 thru 5 are to be considered preliminary adjustments
Caution: Do not use extension cord except for temperature and trouble shooting.

1. TEST EQUIPMENT:

   1.1 DLO Test Harness
   1.2 TEU Set-up Station

2. TEU ASSEMBLY - Inspection not required.

   2.1 Install components C11, C12, C14, R46, R48, R49 and Jumper for R40. The values of these components are in tables 1 and 2. These components should be soldered in lightly.

      2.1.1 Table I gives trial values of the above mentioned items for channels 4 to 14. These values have been selected as absolute minimum values so that they will have to be increased by adding small trimmers in parallel and never decreased.

      2.1.2 Table II gives trial values for the sensitivity to be used with transducers. The approximate sensitivity of the transducer and its schematic must be known to use this table.

3. OSCILLATOR GO-NO GO STATION; Inspection not required.

   3.1 Put DLO in oven at 85°C for 10 minutes. Cool to room temperature for 10 minutes. Repeat three times.

   3.2 Set plus 28 volt supply to 28 ± .1 volt DC.

   3.3 Set negative 28 volt supply to -28 ± .1 volt DC.

   3.4 The DLO Input switch shall remain in the NORMAL position for the complete MTP operation.

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3.5 DLO "Cal 0" switch in "Cal 0" position.

3.6 Plug in oscillator.

3.7 Attach lead from Keithley amplifier to test point.

3.8 Adjust C12 and C14 by using decade capacitor boxes, until;

3.9 The amplitude at the test point is between 3 and 5 volts.

3.10 Current drawn must be not more than 18 MA.

3.11 The frequency shall be within + or - 10% of the channel center frequency.

3.12 Simulator box to mid-frequency.

3.13 The center frequency shall not shift more than 5% of the bandwidth from the frequency in paragraphs 3.11 above.

3.14 The amplitude shall not change more than 0.5 volts from paragraph 3.9.

3.15 Switch the simulator box to positive (+) side. The frequency shall increase from the center frequency.

3.16 Switch the simulator box to negative (-) side. The frequency shall decrease from the center frequency.

3.17 Tap the oscillator. The voltage output shall not be eratic.

3.18 This completes the GO-NO GO Test.

3.19 If DLO passes GO-NO GO Test, send it to pre-cal station. If DLO fails GO-NO GO Test, send it to trouble-shooting and rework.

4. OSCILLATOR SET UP STATION: See Figure 1. Inspection not required.

4.1 Set plus 28 volt supply to + 28 $\pm$ 0.1 VDC.

4.2 Set negative volt supply to -28 $\pm$ 0.1 VDC.

4.3 Install the oscillator in the test setup shown in Figure 1.

4.3.1 With DLO input switch in NORMAL.

4.3.2 DLO "Cal 0" switch in "Cal 0" position, adjust C12 and C14 by adding small trimmer capacitors until:

4.3.3 The amplitude at the test point is between 3.6 and 4.4 volts.

4.3.4 The frequency is between the limits for center frequency as given in Table 3, Column 1 (do not permanently solder the smallest value of the capacitor used for C12 and C14.

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4.3.5 If the amplitude is too high, increase C14, if too low (including zero) increase C12.

4.3.6 Current drawn must not exceed 18 MA from positive supply.

4.4 Install the oscillator in the oven and raise the temperature to 65 ± 4°C.

4.5 The following test is to determine if the thyrite is to be changed.

4.5.1 If the output voltage remains within 10% of the output voltage of paragraph 4.3.6 the thyrite is acceptable.

4.5.2 If the output voltage decreases more than 10%, remove the unit from the oven and change R24 to a 3.9K 1% deposited carbon resistor and place the unit in the oven again. If the output voltage changes less than 10%, the thyrite is acceptable; omit steps 4.5.3 and 4.5.4.

4.5.3 If the output voltage still decreases more than 10%, change R25 to a 10K or 11K +0.4% per degree C resistor (Ultronix) and place the unit in the oven again. If the output voltage changes less than 10%, the unit is acceptable; omit step 4.5.4.

4.5.4 If the output voltage still decreases more than 10%, replace the thyrite, change R24 to 3.9K (1% WW) R25 to 10K (1% WW) and repeat steps 4.4 and 4.5.

4.5.5 If the center frequency is not within the limits for center frequency as given in table 3 or the amplitude at the test point is not between 3.6 and 4.4 volts, repeat step 4.3.

4.6 Remove from oven and allow oscillator to reach room temperature.

4.7 Set DLO Input Switch to "normal", transducer to mid-range stimulus. Note any shift in center frequency when the "Cal 0" switch is turned on. Adjust R37, C21 until there is less than 1.8% of BW (Table 3, column 4) change in center frequency + less than .1V change in test point amplitude when switching from the "normal" to "Cal 0" positions. Leave switch on off. (R37 affects freq. and C21 affects Output voltage) CAUTION: Remove lead from test point when through.

4.8 DLO - Cal 0 switch on "Cal 0"; vary the + supply voltage between 25 and 31 volts. The change in frequency should be less than 1.8% of bandwidth as given in Table 3, column 5.

4.8.1 With the supply equal to 28 volts at oscillator, add 50 ohms in series with it, the change in frequency should be less than 1% of BW as given in Table 3, column 4.

4.9 Transducer must be connected to oscillator.

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4.10 Adjust C11 by adding small trimmer capacitors until the amplitude at the test point increases when the transducer is given full range positive and negative stimulus. ~~Injection C11 with effect monitor~~

4.11 When the transducer is given full range positive and negative stimulus the frequency of oscillation should be between 35% and 50% of bandwidth limits as given in Table 3, colums 2 and 3. Adjust components listed in Table II until the deviations are correct. Oscillator must be plugged into panel.

4.11.1 These two deviations should not differ from each other by an amount greater than 4% of BW (Table 3, column 6). If incorrect the linearity of the transducer is probably at fault and must be returned for rework.

4.12 Set DLO - Cal "O" switch to "Cal O", give the transducer ± stimulus. The frequency should be the same on all 3 positions and equal to the center frequency ± 1 count.

4.13 See Page 10, column 7, Table LLL before proceeding ! ! !
CAUTION: Plug oscillator into panel for this test. Read output on pin S (loaded with 21K). The level should be given in Table 3, column 7. Adjust R48 if necessary).

4.14 Repeat step 4.12 with pin R grounded; the level should be given as in Table 3, column 8. (See page 10, column 7 & 8, Table 3).

4.15 Remove transducer and replace with transducer simulator.

4.15.1 Switch the transducer simulator to the positive position.

4.15.2 Adjust the transducer simulator until the frequency of the oscillator is within 35 to 50% of the upper ~~sideboard~~ band limit (see Table 3, column 2).

4.15.3 The "BW adjust" shall not be readjusted for the duration of the temperature test.

5. TEMPERATURE TEST:

5.1 With the oscillator at room temperature record the full range positive, mid-range and negative full range deviations obtained by operating the transducer simulator and Cal "O" frequency.

5.2 Raise the temperature to 65°C and allow 10 minutes soaking time, record center frequency amplitude and the deviations obtained by operating the transducer simulator (full range positive and negative stimulus). (The amplitude should be within the specifications given in Table 3, column 7). If the deviations differ from the deviations obtained in par. 5.1 by 3% or greater, replace R15 with a 100 ohm deposited carbon resistor.

5.2.1 Record Cal "O" frequency, (should be within 1.8% of deviation in 5.1)

5.3 Compute the change in center frequency and by the use of the temperature compensation table for the channel under test, select the proper values of R21 and R22.

5.4 Temporarily install these values in the oscillator. If the center frequency and amplitude are out of specification (as given in step 2), adjust C12, C14 as in paragraph 4.13.

5.5 Repeat paragraph 3.2 through 3.4. Oscillator should now be temperature compensated to within 1.8% of BW.

5.6 Permanently solder all components into the oscillator. Have oscillator potted. This completes preliminary adjustments.

6. TEST PROCEDURE AFTER POTTING: Set up per Figure 1 - Inspection required.

The Inspection department must maintain surveillance of all tests in this section.

6.1 Set plus 28 volt supply to 28 ± 1 volt DC.

6.2 Set negative 28 volt supply to -28 ± .1 volt DC.

6.3 Plug in oscillator.

6.4 Current drawn must not exceed 18 MA.

6.5 With the transducer set on mid-range stimulus and DLO-Cal O switch on "Cal O", vary the supply voltage between 25 and 31 volts. The change in frequency should be less than 1.8% of bandwidth as given in Table 3, column 5.

6.5.1 With the supply equal to 28 volts at oscillator, add 50 ohm in series with it, the change in frequency should be less than 1% of BW as given in Table 3, column 4.

6.5.2 Decrease the supply voltage to 15 volts. Oscillations should be maintained. Remove the 50 ohms, set the input switch to "normal". Set supply to 28V.

6.6 When transducer is given full range positive, midrange and negative stimulus the frequency of oscillations should be between 35% and 50% of bandwidth limits as given in Table 3, column 2 and 3.

6.6.1 These two deviations should not differ from each other by an amount greater than 4% of BW (Table 3, column 6). If incorrect the linearity of the transducer is probably at fault and must be returned for rework.

6.7 Set DLO - Cal "O" switch to "cal O", give the transducer ± stimulus. The frequency should be the same on all 3 positions and equal to the center frequency.

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6. TEST PROCEDURE AFTER POTTING (Cont'd)

Note: See page 10, Table 3, Column 7 before proceeding.

6.8 Caution: Plug oscillator into panel for this test. Read output on pin S (loaded with 21K). The level should be given in Table 3, column 7. Adjust R48 if necessary.

6.9 Repeat step 8 with pin R grounded; the level should be given as in Table 3, column 8.

6.10 With the oscillator at room temperature record the full range positive, midrange and negative full range deviations obtained by operating the transducer simulator. Record Cal "0" frequency.

6.11 Raise temperature to 65°C and allow 10 minutes soaking time, record center frequency amplitude and the deviations obtained by operating the transducer simulator (full positive, midrange and negative stimulus). Record Cal "0" frequency.

6.12 The amplitude should be within the specifications given in Table 3, column 7. Note: See page 10, column 7, Table 3, before proceeding.

6.13 If the deviations differ from the deviations obtained in paragraph 6.11 by greater than 3%, of bandwidth, reject the oscillator. Cal "0" frequency shall be within 2% of bandwidth.

6.14 After the oscillator has returned to room temperature run 9 points of calibration from the high to the low side; then run 9 more points (different from the first run) from the low side to the high side. Forward this information to Data Reduction.

6.15 This completes the test.

TABLE I

CHANNEL	C12, C14	MFG. & TYPE	C11	MFG. & TYPE
4	12,500 uuf	Corning Glass CY20 or Electron Products Type PS-200	.033 ufd	Hopkins
5	9,100 uuf	Corning Glass CY20 or Electron Products Type PS-200	.022 uf	Hopkins
6	6,800 uuf	Corning Glass CY-20 or Electron Products Type PS-200	.022 uf	Hopkins
7	5,100 uuf	Corning Glass CY-20	.015 uf	Hopkins
8	3,900 uuf	Corning Glass CY-20	.01 uf	Hopkins
9	3,000 uuf	Corning Glass CY-20	.0068 uf	Hopkins
10	2,200 uuf	Corning Glass CY-20	4700 uuf	Corning Glass CY-20
11	1,600 uuf	Corning Glass CY-20	4300 uuf	Corning Glass CY-20
12	1,200 uuf	Corning Glass CY-20	2700 uuf	Corning Glass CY-20
13	820 uuf	Corning Glass CY-20	1800 uuf	Corning Glass CY-20
14	560 uuf	Corning Glass CY-20	1100 uuf	Corning Glass CY-20
15	390 uuf	Corning Glass CY-20	750 uuf	Corning Glass CY-20

R36, R37, C21 omitted for case 1
R48, R49 - TR 110

R21 - 5 K Kelvin
R22 - 5K deposited carbon

Trimmer Capacitors
Corning Glass

R48 and R49 values will be included after determination by research)

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TABLE II

R6 = 100 ohms

R46 = 500 ohms

R40 = Sensitivity adjustment resistor

Low Gain DLO-1		Hi Gain DLO-2	
Transducer Sensitivity	R40 Values	Transducer Sensitivity	R40 Values
4 MV/V	75	4 MV/V	1.5K
10 MV/V	240	10 MV/V	4.7K
20 MV/V	500	20 MV/V	10 K
40 MV/V	1000	40 MV/V	20 K
100 MV/V	2.5 K	100 MV/V	50 K

TABLE III

CH. NO.	COLUMN 1 TOLERANCE ±3% BW	COLUMN 1 CENTER FREQ.	COLUMN 1 TOLERANCE -3% BW	COLUMN 2 CALIBRATE + 35% BW	COLUMN 2 CALIBRATE + 50% BW	COLUMN 3 CALIBRATE - 35# BW	COLUMN 3 CALIBRATE - 50# BW	COL.4 1% BW	COL.5 1.8% BW	COL.6 2% BW	COL.7 CONTD.
4.	964.3	960	955.7	1010	1032	910	888	1.4	2.6	2.9	
5.	1306	1300	1294	1369	1398	1231	1202	2.0	3.5	3.9	
6.	1708	1700	1692	1790	1828	1610	1572	2.6	4.6	5.1	
7.	2310	2300	2240	2421	2473	2179	2127	3.5	6.3	6.9	
8.	3014	3000	2987	3158	3225	2843	2775	4.5	8.1	9	
9.	3918	3900	3882	4105	4193	3695	3607	6	11	12	
10.	5424	5400	5376	5684	5805	5117	4995	8	15	16	
11.	7383	7350	7317	7736	7901	6964	6799	11	20	22	
12.	10547	10500	10453	11052	11228	9948	9712	15	27	30	
13.	14565	14500	14435	15262	15588	13738	13412	22	39	44	
14.	22099	22000	21901	23155	23650	20845	20350	33	59	66	
15	30135	30000	29865	31575	32250	28425	27750	45	81	90	

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TABLE III - COLUMN 7

The output of all DLO's for AX-10 Link 3 and up are as follows:

Ch 3 through 13 is 110MV ± 10%

Ch 14 through 15 is 200MV ± 10%

To obtain the above output voltages for AX-10 Link 3 through AX-14, Channels 3 through 7, it is necessary to connect both outputs of the oscillator together, by setting the pin "N" switch to "N-S" position. On channel 8 through 15, the output can be obtained with one output grounded, by setting the pin "N" switch to "GND".

For AX-15 and up all Channel DLO's shall have both outputs connected together.

TABLE III - COLUMN 8

Use the voltage obtained in column 7 - 30% (± 5%).

TEMPERATURE COMPENSATION CHART

Change in Center Frequency Between Room Temperature and 65°C	(% BW)	R21 Wire Wound	R22 Deposited Carbon
-4%		0	10000
-3%		900	9100
-2%		1800	8200
-1%		3200	6800
+1%		6700	3300
+2%		8400	1600
+3%		9100	910
+4%		10000	0

Other intermediate values may be used at will when available.

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